

Scaled data based on original data using  
LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: McGRAW-EDISON

Report Number: P510610

Luminaire Tested: **CTN-CA10-760-740-U-T4-HSS**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510610  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-17)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: CTN-CA10-760-740-U-T4-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (10) 4000K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 94269 lumens  
Efficiency: N/A  
Efficacy: 123.7 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B4 - U0 - G5

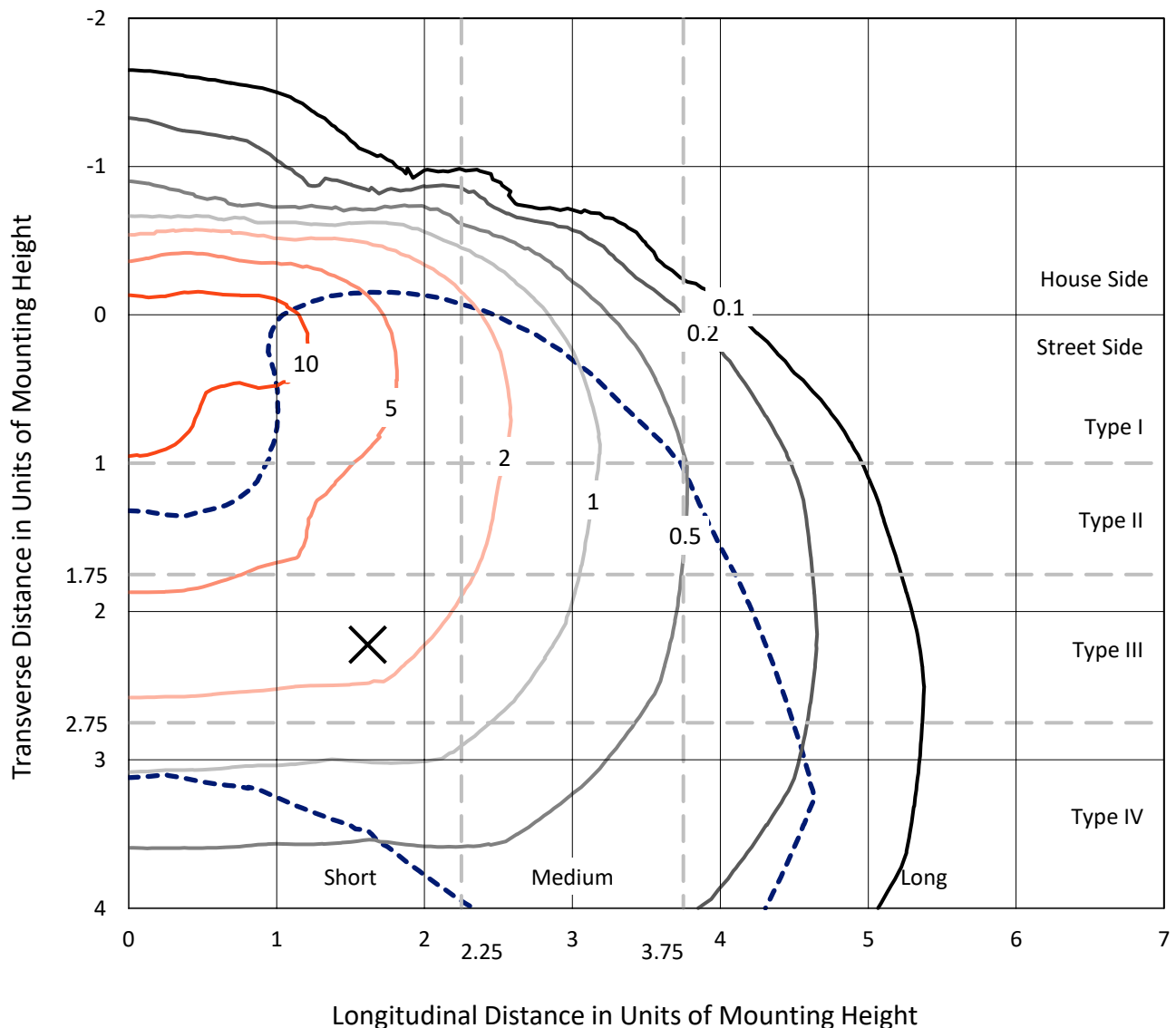
Input Watts (W): 761.9  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



REPORT NUMBER: P510610  
 CATALOG NUMBER: CTN-CA10-760-740-U-T4-HSS

## Iso-Footcandle Lines of Horizontal Illumination

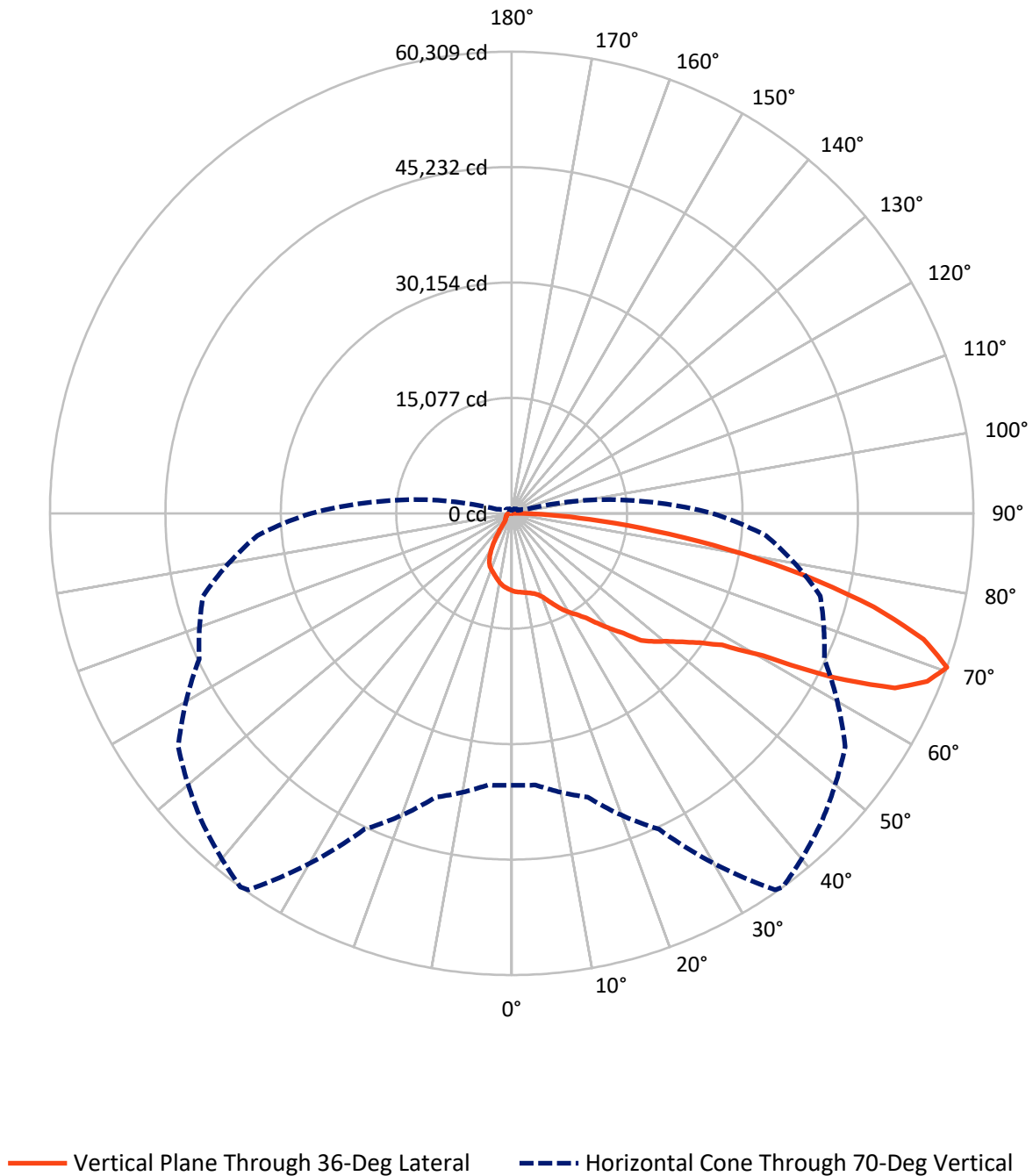
× Max cd  
 - - - 1/2 Max cd



Based on 30 foot mounting height. Maximum calculated value = 12.8 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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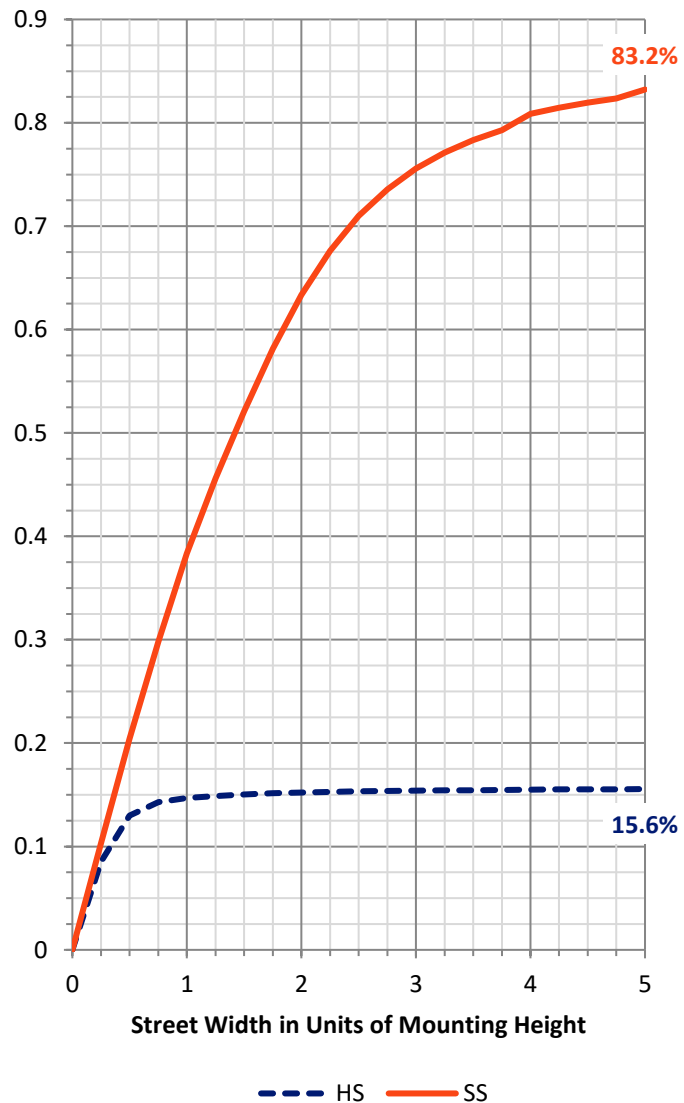
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 14876.3  | 0.0    | 14876.3 |
|                    | % Fixture | 15.8     | 0.0    | 15.8    |
| <b>Street Side</b> | Lumens    | 79392.7  | 0.0    | 79392.7 |
|                    | % Fixture | 84.2     | 0.0    | 84.2    |
| <b>Total</b>       | Lumens    | 94269.0  | 0.0    | 94269.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 957.9   | 1.0       |
| 10°-20°   | 2848.7  | 3.0       |
| 20°-30°   | 5122.8  | 5.4       |
| 30°-40°   | 8106.8  | 8.6       |
| 40°-50°   | 12669.4 | 13.4      |
| 50°-60°   | 18193.0 | 19.3      |
| 60°-70°   | 24677.2 | 26.2      |
| 70°-80°   | 18263.8 | 19.4      |
| 80°-90°   | 3429.4  | 3.6       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 94269.0 | 100.0     |
| 0°-180°   | 94269.0 | 100.0     |

**Coefficient of Utilization**



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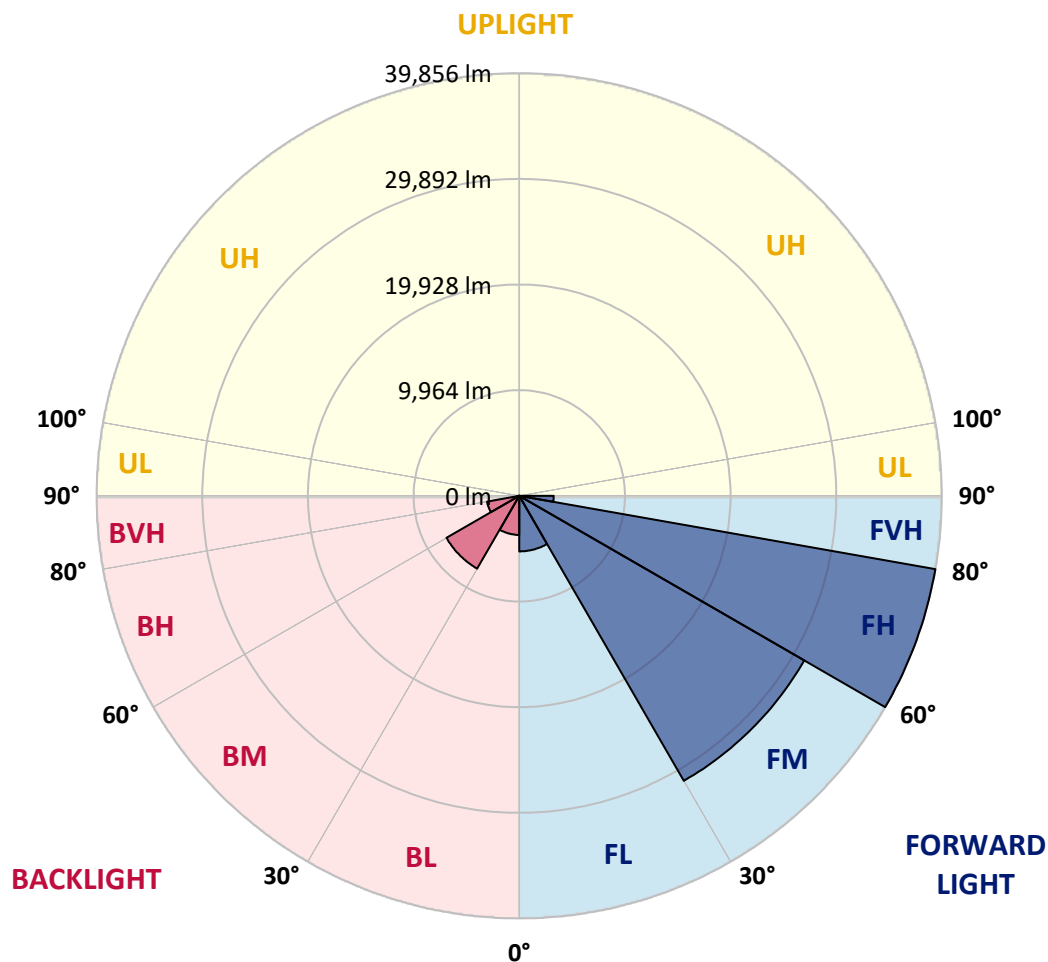
CATALOG NUMBER: CTN-CA10-760-740-U-T4-HSS

**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 5243.2  | 5.6       |                         |      |         |
| FM   | (30°-60°)   | 31041.9 | 32.9      |                         |      |         |
| FH   | (60°-80°)   | 39856.0 | 42.3      |                         |      | G5      |
| FVH  | (80°-90°)   | 3251.5  | 3.4       |                         |      | G5      |
| BL   | (0°-30°)    | 3686.3  | 3.9       | B4/5000                 |      |         |
| BM   | (30°-60°)   | 7927.3  | 8.4       | B4/8500                 |      |         |
| BH   | (60°-80°)   | 3084.9  | 3.3       | B4/5000                 |      | G4/5000 |
| BVH  | (80°-90°)   | 177.9   | 0.2       |                         |      | G2/225  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B4-U0-G5**

Type IV Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 36°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 |
| 2.5°  | 10305.0 | 10283.3 | 10265.9 | 10272.4 | 10259.3 | 10268.0 | 10248.4 | 10224.5 | 10167.9 | 10144.0 | 10133.1 |
| 5°    | 10396.4 | 10389.9 | 10372.5 | 10359.4 | 10335.5 | 10326.8 | 10305.0 | 10324.6 | 10294.1 | 10215.8 | 10170.1 |
| 7.5°  | 10450.8 | 10448.7 | 10429.1 | 10400.8 | 10413.8 | 10424.7 | 10446.5 | 10416.0 | 10376.9 | 10339.9 | 10246.3 |
| 10°   | 10474.8 | 10474.8 | 10450.8 | 10466.1 | 10533.5 | 10540.1 | 10551.0 | 10570.5 | 10533.5 | 10479.1 | 10385.6 |
| 12.5° | 10535.7 | 10531.4 | 10540.1 | 10590.1 | 10659.8 | 10675.0 | 10729.4 | 10729.4 | 10733.8 | 10701.1 | 10592.3 |
| 15°   | 10688.1 | 10688.1 | 10707.7 | 10753.4 | 10873.1 | 10881.8 | 10962.3 | 11034.1 | 11042.8 | 10994.9 | 10912.2 |
| 17.5° | 11040.6 | 11031.9 | 11021.1 | 11049.3 | 11177.7 | 11182.1 | 11321.4 | 11412.8 | 11436.7 | 11489.0 | 11475.9 |
| 20°   | 11711.0 | 11702.2 | 11700.1 | 11702.2 | 11693.5 | 11680.5 | 11817.6 | 11915.5 | 12037.4 | 12128.8 | 12174.5 |
| 22.5° | 12670.7 | 12651.1 | 12651.1 | 12544.5 | 12461.8 | 12474.9 | 12496.6 | 12551.0 | 12712.1 | 12873.1 | 13045.1 |
| 25°   | 13704.5 | 13691.4 | 13702.3 | 13430.3 | 13319.3 | 13362.8 | 13334.5 | 13419.4 | 13630.5 | 13769.8 | 13952.6 |
| 27.5° | 14548.9 | 14568.5 | 14507.6 | 14296.5 | 14224.6 | 14257.3 | 14192.0 | 14435.7 | 14668.6 | 14912.4 | 15188.8 |
| 30°   | 15600.1 | 15495.6 | 15345.5 | 15088.7 | 15062.5 | 15066.9 | 15062.5 | 15454.3 | 15937.4 | 16285.6 | 16668.7 |
| 32.5° | 16973.4 | 16990.8 | 16653.5 | 16048.4 | 15826.4 | 15796.0 | 15883.0 | 16457.6 | 17110.5 | 17883.1 | 18388.0 |
| 35°   | 18361.9 | 18390.2 | 18144.3 | 17513.1 | 16879.8 | 16784.0 | 16655.6 | 17402.1 | 18344.5 | 19894.0 | 20655.8 |
| 37.5° | 19835.3 | 19935.4 | 19643.8 | 19080.1 | 18329.2 | 18240.0 | 17632.8 | 18366.2 | 19759.1 | 22275.0 | 23273.9 |
| 40°   | 21807.1 | 21700.4 | 21347.8 | 20631.8 | 19933.2 | 19789.6 | 19084.4 | 19469.7 | 21578.5 | 25256.6 | 25981.3 |
| 42.5° | 23260.9 | 23230.4 | 22932.2 | 22224.9 | 21522.0 | 21406.6 | 20838.6 | 21256.4 | 23870.2 | 28279.5 | 28603.8 |
| 45°   | 24414.3 | 24601.5 | 24595.0 | 24151.0 | 23754.9 | 23689.6 | 23354.4 | 23970.4 | 26640.7 | 31132.7 | 30973.9 |
| 47.5° | 25439.4 | 25554.7 | 25369.7 | 25176.0 | 24991.1 | 25012.8 | 25260.9 | 26527.6 | 29472.2 | 33624.7 | 32921.7 |
| 50°   | 27117.4 | 26969.4 | 26140.2 | 25992.2 | 26253.3 | 26264.2 | 27019.4 | 28969.4 | 32590.9 | 35779.2 | 34571.4 |
| 52.5° | 29354.6 | 29193.6 | 27489.5 | 27237.1 | 27855.1 | 27900.8 | 29156.6 | 31402.6 | 35807.5 | 37838.1 | 36212.3 |
| 55°   | 32684.5 | 32310.1 | 30484.2 | 29352.5 | 29635.4 | 29820.4 | 31341.7 | 33742.2 | 38325.6 | 39653.1 | 37455.0 |
| 57.5° | 36773.8 | 37045.9 | 36110.0 | 33552.8 | 32375.4 | 32445.1 | 33842.3 | 35981.6 | 40547.6 | 41241.9 | 38181.9 |
| 60°   | 41096.1 | 41030.8 | 41422.5 | 40345.2 | 38090.5 | 37716.2 | 37004.5 | 38266.8 | 42269.1 | 42580.3 | 38930.6 |
| 62.5° | 43463.9 | 43844.8 | 45150.6 | 45366.1 | 47401.0 | 47202.9 | 42351.8 | 41100.4 | 44258.3 | 43420.4 | 39135.2 |
| 65°   | 43450.9 | 43616.3 | 46047.3 | 48719.8 | 55077.0 | 55020.4 | 52765.7 | 45198.5 | 45740.4 | 43868.7 | 38726.0 |
| 67.5° | 40643.4 | 40900.2 | 43742.5 | 48963.6 | 58624.4 | 58556.9 | 56998.7 | 50959.3 | 46206.1 | 43329.0 | 36817.4 |
| 70°   | 35524.6 | 35611.7 | 38384.3 | 45531.5 | 60049.9 | 60308.9 | 57144.5 | 53170.5 | 45048.3 | 41725.0 | 33337.4 |
| 72.5° | 29306.8 | 29126.1 | 31837.9 | 38882.7 | 56419.8 | 56265.3 | 54728.7 | 50530.6 | 43098.3 | 38610.7 | 27189.2 |
| 75°   | 21578.5 | 22081.3 | 24514.4 | 31219.8 | 48306.3 | 48872.2 | 49553.4 | 46491.2 | 38277.7 | 31820.5 | 18801.5 |
| 77.5° | 14248.6 | 14888.4 | 17347.7 | 23408.9 | 38242.9 | 39122.1 | 40887.1 | 39542.2 | 31139.3 | 22825.6 | 8953.5  |
| 80°   | 7362.6  | 7845.8  | 10059.1 | 15532.6 | 27415.5 | 28684.3 | 31920.6 | 29948.8 | 22076.9 | 10320.3 | 2004.4  |
| 82.5° | 2785.7  | 2722.6  | 4507.2  | 8890.4  | 17578.4 | 18731.9 | 21084.5 | 17959.3 | 7856.6  | 1812.9  | 931.5   |
| 85°   | 1223.1  | 1294.9  | 1867.3  | 4054.5  | 10050.4 | 10200.6 | 11943.8 | 7001.3  | 1151.3  | 866.2   | 633.3   |
| 87.5° | 528.9   | 607.2   | 783.5   | 1166.5  | 3390.8  | 3915.3  | 4844.6  | 2224.2  | 348.2   | 300.3   | 317.7   |
| 90°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |

REPORT NUMBER: P510610

CATALOG NUMBER: CTN-CA10-760-740-U-T4-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°    | 115°    | 125°    | 135°    | 145°    | 155°    | 165°    | 175°    | 180°    |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 | 10100.5 |
| 2.5°  | 10113.5 | 10100.5 | 10078.7 | 10024.3 | 9935.1  | 9924.2  | 9915.5  | 9906.8  | 9889.3  | 9898.1  | 9948.1  |
| 5°    | 10135.3 | 10111.3 | 10033.0 | 9954.6  | 9876.3  | 9806.6  | 9721.8  | 9689.1  | 9645.6  | 9617.3  | 9669.5  |
| 7.5°  | 10209.3 | 10159.2 | 10043.9 | 9937.2  | 9723.9  | 9621.7  | 9512.8  | 9384.4  | 9293.0  | 9234.3  | 9286.5  |
| 10°   | 10333.3 | 10270.2 | 10126.6 | 9906.8  | 9656.5  | 9375.7  | 9184.2  | 8970.9  | 8796.8  | 8748.9  | 8796.8  |
| 12.5° | 10535.7 | 10442.1 | 10274.6 | 9976.4  | 9532.4  | 9164.6  | 8801.2  | 8520.4  | 8239.7  | 8159.1  | 8183.1  |
| 15°   | 10864.4 | 10790.4 | 10533.5 | 10122.2 | 9534.6  | 8973.1  | 8433.4  | 7980.7  | 7612.9  | 7484.5  | 7475.8  |
| 17.5° | 11391.0 | 11312.7 | 11016.7 | 10411.7 | 9613.0  | 8822.9  | 8072.1  | 7382.2  | 6825.0  | 6542.1  | 6496.4  |
| 20°   | 12146.2 | 12037.4 | 11589.1 | 10838.2 | 9782.7  | 8757.6  | 7736.9  | 6809.8  | 5943.6  | 5412.6  | 5332.1  |
| 22.5° | 12986.3 | 12871.0 | 12209.3 | 11166.9 | 9904.6  | 8629.2  | 7417.0  | 6176.5  | 5036.1  | 4387.5  | 4296.1  |
| 25°   | 14030.9 | 13778.5 | 12803.5 | 11478.1 | 9876.3  | 8359.4  | 6896.9  | 5316.8  | 4080.7  | 3519.2  | 3458.2  |
| 27.5° | 15062.5 | 14742.6 | 13408.5 | 11641.3 | 9752.2  | 7930.6  | 6135.1  | 4311.4  | 3194.9  | 2796.6  | 2746.6  |
| 30°   | 16342.2 | 15724.1 | 13946.1 | 11717.5 | 9438.8  | 7288.6  | 5114.4  | 3277.6  | 2391.8  | 2117.6  | 2069.7  |
| 32.5° | 17863.5 | 16927.7 | 14451.0 | 11632.6 | 8916.5  | 6309.2  | 3976.2  | 2400.5  | 1778.1  | 1606.1  | 1604.0  |
| 35°   | 19870.1 | 18403.2 | 15006.0 | 11354.0 | 8115.6  | 5253.7  | 2787.9  | 1641.0  | 1386.3  | 1327.6  | 1338.5  |
| 37.5° | 22216.2 | 20401.1 | 15569.6 | 10897.0 | 7210.3  | 4019.7  | 1858.6  | 1264.5  | 1218.8  | 1220.9  | 1223.1  |
| 40°   | 24690.7 | 22608.0 | 16329.2 | 10255.0 | 6111.2  | 2909.8  | 1338.5  | 1136.1  | 1133.9  | 1155.6  | 1162.2  |
| 42.5° | 27054.2 | 24751.7 | 17265.0 | 9399.7  | 4959.9  | 1923.9  | 1160.0  | 1083.8  | 1055.5  | 1064.2  | 1070.8  |
| 45°   | 29250.2 | 26590.7 | 18061.6 | 8566.1  | 3725.9  | 1373.3  | 1138.2  | 1022.9  | 979.4   | 975.0   | 979.4   |
| 47.5° | 31019.6 | 28064.1 | 18546.9 | 7586.8  | 2655.2  | 1140.4  | 1092.5  | 966.3   | 905.4   | 892.3   | 885.8   |
| 50°   | 32366.7 | 29158.8 | 18723.2 | 6476.8  | 1795.5  | 1088.2  | 1031.6  | 901.0   | 827.0   | 829.2   | 829.2   |
| 52.5° | 33681.2 | 30153.4 | 18518.6 | 5358.2  | 1321.0  | 1042.5  | 990.2   | 848.8   | 770.4   | 811.8   | 822.7   |
| 55°   | 34628.0 | 30571.2 | 17922.3 | 4148.1  | 1101.2  | 985.9   | 944.5   | 787.8   | 733.4   | 800.9   | 822.7   |
| 57.5° | 35180.7 | 30899.9 | 16827.6 | 2994.7  | 1009.8  | 931.5   | 885.8   | 731.3   | 681.2   | 698.6   | 709.5   |
| 60°   | 35524.6 | 30440.6 | 15380.3 | 2047.9  | 961.9   | 888.0   | 827.0   | 694.3   | 626.8   | 585.4   | 578.9   |
| 62.5° | 35335.3 | 29291.5 | 13473.8 | 1408.1  | 911.9   | 840.1   | 777.0   | 659.4   | 570.2   | 515.8   | 511.4   |
| 65°   | 33792.2 | 27165.2 | 10344.2 | 1140.4  | 881.4   | 818.3   | 746.5   | 626.8   | 531.0   | 478.8   | 472.3   |
| 67.5° | 30930.3 | 23343.6 | 6041.6  | 1014.2  | 868.4   | 796.5   | 722.5   | 596.3   | 509.3   | 452.7   | 444.0   |
| 70°   | 26227.2 | 17558.8 | 2024.0  | 905.4   | 866.2   | 794.4   | 703.0   | 574.6   | 485.3   | 426.6   | 417.9   |
| 72.5° | 18921.2 | 10594.5 | 985.9   | 796.5   | 809.6   | 761.7   | 687.7   | 557.1   | 470.1   | 396.1   | 380.9   |
| 75°   | 10753.4 | 3449.5  | 890.1   | 687.7   | 753.0   | 726.9   | 679.0   | 559.3   | 476.6   | 359.1   | 341.7   |
| 77.5° | 3060.0  | 1007.7  | 859.7   | 585.4   | 711.7   | 750.8   | 635.5   | 504.9   | 487.5   | 333.0   | 311.2   |
| 80°   | 1033.8  | 896.7   | 829.2   | 454.9   | 574.6   | 620.3   | 550.6   | 444.0   | 491.9   | 302.5   | 280.7   |
| 82.5° | 829.2   | 901.0   | 696.4   | 363.5   | 437.4   | 470.1   | 437.4   | 398.3   | 398.3   | 269.9   | 252.5   |
| 85°   | 663.8   | 835.7   | 441.8   | 289.5   | 326.5   | 361.3   | 309.0   | 298.2   | 278.6   | 226.3   | 219.8   |
| 87.5° | 385.2   | 261.2   | 182.8   | 148.0   | 137.1   | 139.3   | 119.7   | 143.6   | 176.3   | 154.5   | 152.3   |
| 90°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |

LM-79-08: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

STREETWORKS

Report Number: SP1-2104-215-1

Luminaire Tested: CST-CA6-230-740-U-T4

Test Date: 04/20/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-215-1  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 04/20/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: STREETWORKS  
 Catalog Number: **CST-CA6-230-740-U-T4**  
 Description: STREETWORKS HIGH MAST LUMINAIRE

230W

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 3783    | CRI (Ra): | 75.1 |      |       |
| CIE u':                   | 0.2297  | R1:       | 72.8 | R9:  | -19.0 |
| CIE v':                   | 0.5046  | R2:       | 81.9 | R10: | 57.0  |
| Duv:                      | -0.0008 | R3:       | 89.0 | R11: | 70.7  |
| CIE x:                    | 0.3897  | R4:       | 74.1 | R12: | 48.2  |
| CIE y:                    | 0.3804  | R5:       | 72.3 | R13: | 74.4  |
| CIE z:                    | 0.2299  | R6:       | 74.5 | R14: | 93.7  |
| Peak Wavelength (nm):     | 450     | R7:       | 81.7 |      |       |
| Dominant Wavelength (nm): | 580     | R8:       | 54.6 |      |       |
| Purity:                   | 31.3    |           |      |      |       |
| Rf:                       | 76.5    |           |      |      |       |
| Rg:                       | 95.6    |           |      |      |       |



### Test Conditions

Stabilization Time: 47M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.5/39%  
 Sphere Temperature (°C): 24.0

REPORT NUMBER: SP1-2104-215-1

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 1/31/2021        | 7/31/2021            |
| Power Meter                    | IN0071                | 12/1/2020        | 12/1/2021            |
| AC Power Source                | IN0063                | 12/1/2020        | 12/1/2021            |
| DC Power Source                | IN0208                | 12/1/2020        | 12/1/2021            |
| Sphere Thermometer             | IN0085                | 12/1/2020        | 12/1/2021            |
| Room Thermometer               | IN0046                | 12/1/2020        | 12/1/2021            |

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**CIE 1931 Chromaticity Diagram**



**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 4000K 7-step quadrangle

REPORT NUMBER: SP1-2104-215-1

### Photopic Flux vs. Wavelength



#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 13329            | 0.0              | 490       | 105235           | 15.0             | 620       | 524343           | 136.4            | 750       | 24224            | 0.0              | 880       | 16135            | 0.0              |
| 365       | 11697            | 0.0              | 495       | 137678           | 25.0             | 625       | 488932           | 107.9            | 755       | 22376            | 0.0              | 885       | 16876            | 0.0              |
| 370       | 10917            | 0.0              | 500       | 186689           | 41.2             | 630       | 445400           | 80.6             | 760       | 20109            | 0.0              | 890       | 13554            | 0.0              |
| 375       | 12548            | 0.0              | 505       | 244611           | 68.4             | 635       | 403534           | 60.6             | 765       | 18097            | 0.0              | 895       | 11525            | 0.0              |
| 380       | 13932            | 0.0              | 510       | 298987           | 102.7            | 640       | 366414           | 43.8             | 770       | 17366            | 0.0              | 900       | 14656            | 0.0              |
| 385       | 13265            | 0.0              | 515       | 348170           | 144.2            | 645       | 331272           | 31.9             | 775       | 16226            | 0.0              | 905       | 11999            | 0.0              |
| 390       | 11808            | 0.0              | 520       | 390427           | 189.3            | 650       | 297360           | 21.7             | 780       | 14803            | 0.0              | 910       | 12965            | 0.0              |
| 395       | 10395            | 0.0              | 525       | 421211           | 226.1            | 655       | 263291           | 15.1             | 785       | 15199            | 0.0              | 915       | 15939            | 0.0              |
| 400       | 9348             | 0.0              | 530       | 446063           | 262.6            | 660       | 232931           | 9.7              | 790       | 12989            | 0.0              | 920       | 16238            | 0.0              |
| 405       | 9479             | 0.0              | 535       | 465110           | 288.4            | 665       | 204719           | 6.5              | 795       | 12106            | 0.0              | 925       | 14419            | 0.0              |
| 410       | 12414            | 0.0              | 540       | 479189           | 312.2            | 670       | 177096           | 3.9              | 800       | 12942            | 0.0              | 930       | 14788            | 0.0              |
| 415       | 21574            | 0.0              | 545       | 495864           | 330.0            | 675       | 153254           | 2.6              | 805       | 13253            | 0.0              | 935       | 18619            | 0.0              |
| 420       | 41448            | 0.1              | 550       | 516625           | 351.1            | 680       | 132874           | 1.5              | 810       | 12808            | 0.0              | 940       | 13995            | 0.0              |
| 425       | 79385            | 0.4              | 555       | 538555           | 367.8            | 685       | 115378           | 1.0              | 815       | 12903            | 0.0              | 945       | 18047            | 0.0              |
| 430       | 141845           | 1.1              | 560       | 562412           | 382.2            | 690       | 100157           | 0.6              | 820       | 12621            | 0.0              | 950       | 21418            | 0.0              |
| 435       | 231290           | 2.7              | 565       | 585835           | 389.5            | 695       | 85561            | 0.4              | 825       | 13903            | 0.0              | 955       | 23138            | 0.0              |
| 440       | 374482           | 5.9              | 570       | 608681           | 395.8            | 700       | 75396            | 0.2              | 830       | 11870            | 0.0              | 960       | 13665            | 0.0              |
| 445       | 596715           | 12.4             | 575       | 629563           | 391.7            | 705       | 65658            | 0.1              | 835       | 11069            | 0.0              | 965       | 14793            | 0.0              |
| 450       | 719656           | 18.7             | 580       | 646820           | 384.3            | 710       | 58172            | 0.1              | 840       | 15291            | 0.0              | 970       | 14396            | 0.0              |
| 455       | 530438           | 17.8             | 585       | 659231           | 366.3            | 715       | 52563            | 0.1              | 845       | 15125            | 0.0              | 975       | 11155            | 0.0              |
| 460       | 330446           | 13.5             | 590       | 665630           | 344.2            | 720       | 47085            | 0.0              | 850       | 15336            | 0.0              | 980       | 17987            | 0.0              |
| 465       | 241999           | 12.5             | 595       | 656228           | 311.1            | 725       | 41741            | 0.0              | 855       | 15791            | 0.0              | 985       | 16185            | 0.0              |
| 470       | 167096           | 10.4             | 600       | 646946           | 278.8            | 730       | 37415            | 0.0              | 860       | 14660            | 0.0              | 990       | 22120            | 0.0              |
| 475       | 113791           | 8.9              | 605       | 628643           | 243.4            | 735       | 32125            | 0.0              | 865       | 12528            | 0.0              | 995       | 11943            | 0.0              |
| 480       | 96126            | 9.1              | 610       | 599057           | 205.8            | 740       | 29322            | 0.0              | 870       | 14089            | 0.0              | 1000      | 16020            | 0.0              |
| 485       | 94467            | 11.2             | 615       | 565669           | 170.8            | 745       | 26862            | 0.0              | 875       | 11732            | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



Scotopic Lumens: 54268.8

S/P: 1.5

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) |
|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| 360               | 13329                         | 0.0                            | 490               | 105235                        | 162.0                          | 620               | 524343                        | 6.6                            | 750               | 24224                         | 0.0                            | 880               | 16135                         | 0.0                            |
| 365               | 11697                         | 0.0                            | 495               | 137678                        | 222.6                          | 625               | 488932                        | 4.1                            | 755               | 22376                         | 0.0                            | 885               | 16876                         | 0.0                            |
| 370               | 10917                         | 0.0                            | 500               | 186689                        | 312.3                          | 630               | 445400                        | 2.5                            | 760               | 20109                         | 0.0                            | 890               | 13554                         | 0.0                            |
| 375               | 12548                         | 0.0                            | 505               | 244611                        | 415.8                          | 635               | 403534                        | 1.5                            | 765               | 18097                         | 0.0                            | 895               | 11525                         | 0.0                            |
| 380               | 13932                         | 0.0                            | 510               | 298987                        | 506.8                          | 640               | 366414                        | 0.9                            | 770               | 17366                         | 0.0                            | 900               | 14656                         | 0.0                            |
| 385               | 13265                         | 0.0                            | 515               | 348170                        | 577.1                          | 645               | 331272                        | 0.6                            | 775               | 16226                         | 0.0                            | 905               | 11999                         | 0.0                            |
| 390               | 11808                         | 0.0                            | 520               | 390427                        | 620.6                          | 650               | 297360                        | 0.3                            | 780               | 14803                         | 0.0                            | 910               | 12965                         | 0.0                            |
| 395               | 10395                         | 0.1                            | 525               | 421211                        | 630.1                          | 655               | 263291                        | 0.2                            | 785               | 15199                         | 0.0                            | 915               | 15939                         | 0.0                            |
| 400               | 9348                          | 0.1                            | 530               | 446063                        | 615.0                          | 660               | 232931                        | 0.1                            | 790               | 12989                         | 0.0                            | 920               | 16238                         | 0.0                            |
| 405               | 9479                          | 0.3                            | 535               | 465110                        | 579.6                          | 665               | 204719                        | 0.1                            | 795               | 12106                         | 0.0                            | 925               | 14419                         | 0.0                            |
| 410               | 12414                         | 0.7                            | 540               | 479189                        | 529.5                          | 670               | 177096                        | 0.0                            | 800               | 12942                         | 0.0                            | 930               | 14788                         | 0.0                            |
| 415               | 21574                         | 2.2                            | 545               | 495864                        | 475.4                          | 675               | 153254                        | 0.0                            | 805               | 13253                         | 0.0                            | 935               | 18619                         | 0.0                            |
| 420               | 41448                         | 6.8                            | 550               | 516625                        | 422.4                          | 680               | 132874                        | 0.0                            | 810               | 12808                         | 0.0                            | 940               | 13995                         | 0.0                            |
| 425               | 79385                         | 19.4                           | 555               | 538555                        | 368.0                          | 685               | 115378                        | 0.0                            | 815               | 12903                         | 0.0                            | 945               | 18047                         | 0.0                            |
| 430               | 141845                        | 48.3                           | 560               | 562412                        | 314.4                          | 690               | 100157                        | 0.0                            | 820               | 12621                         | 0.0                            | 950               | 21418                         | 0.0                            |
| 435               | 231290                        | 103.4                          | 565               | 585835                        | 262.8                          | 695               | 85561                         | 0.0                            | 825               | 13903                         | 0.0                            | 955               | 23138                         | 0.0                            |
| 440               | 374482                        | 209.3                          | 570               | 608681                        | 214.8                          | 700               | 75396                         | 0.0                            | 830               | 11870                         | 0.0                            | 960               | 13665                         | 0.0                            |
| 445               | 596715                        | 399.6                          | 575               | 629563                        | 171.5                          | 705               | 65658                         | 0.0                            | 835               | 11069                         | 0.0                            | 965               | 14793                         | 0.0                            |
| 450               | 719656                        | 557.8                          | 580               | 646820                        | 133.3                          | 710               | 58172                         | 0.0                            | 840               | 15291                         | 0.0                            | 970               | 14396                         | 0.0                            |
| 455               | 530438                        | 463.5                          | 585               | 659231                        | 100.8                          | 715               | 52563                         | 0.0                            | 845               | 15125                         | 0.0                            | 975               | 11155                         | 0.0                            |
| 460               | 330446                        | 319.2                          | 590               | 665630                        | 74.1                           | 720               | 47085                         | 0.0                            | 850               | 15336                         | 0.0                            | 980               | 17987                         | 0.0                            |
| 465               | 241999                        | 255.6                          | 595               | 656228                        | 52.3                           | 725               | 41741                         | 0.0                            | 855               | 15791                         | 0.0                            | 985               | 16185                         | 0.0                            |
| 470               | 167096                        | 192.4                          | 600               | 646946                        | 36.5                           | 730               | 37415                         | 0.0                            | 860               | 14660                         | 0.0                            | 990               | 22120                         | 0.0                            |
| 475               | 113791                        | 142.3                          | 605               | 628643                        | 24.7                           | 735               | 32125                         | 0.0                            | 865               | 12528                         | 0.0                            | 995               | 11943                         | 0.0                            |
| 480               | 96126                         | 129.8                          | 610               | 599057                        | 16.2                           | 740               | 29322                         | 0.0                            | 870               | 14089                         | 0.0                            | 1000              | 16020                         | 0.0                            |
| 485               | 94467                         | 136.9                          | 615               | 565669                        | 10.5                           | 745               | 26862                         | 0.0                            | 875               | 11732                         | 0.0                            |                   |                               |                                |

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### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 20938.3**      **M/P: 0.58**

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 13329            | 0.0              | 490       | 105235           | 87.6             | 620       | 524343           | 0.4              | 750       | 24224            | 0.0              | 880       | 16135            | 0.0              |
| 365       | 11697            | 0.0              | 495       | 137678           | 113.7            | 625       | 488932           | 0.3              | 755       | 22376            | 0.0              | 885       | 16876            | 0.0              |
| 370       | 10917            | 0.0              | 500       | 186689           | 150.1            | 630       | 445400           | 0.2              | 760       | 20109            | 0.0              | 890       | 13554            | 0.0              |
| 375       | 12548            | 0.0              | 505       | 244611           | 187.7            | 635       | 403534           | 0.1              | 765       | 18097            | 0.0              | 895       | 11525            | 0.0              |
| 380       | 13932            | 0.0              | 510       | 298987           | 214.7            | 640       | 366414           | 0.1              | 770       | 17366            | 0.0              | 900       | 14656            | 0.0              |
| 385       | 13265            | 0.0              | 515       | 348170           | 227.5            | 645       | 331272           | 0.0              | 775       | 16226            | 0.0              | 905       | 11999            | 0.0              |
| 390       | 11808            | 0.0              | 520       | 390427           | 227.3            | 650       | 297360           | 0.0              | 780       | 14803            | 0.0              | 910       | 12965            | 0.0              |
| 395       | 10395            | 0.1              | 525       | 421211           | 213.6            | 655       | 263291           | 0.0              | 785       | 15199            | 0.0              | 915       | 15939            | 0.0              |
| 400       | 9348             | 0.1              | 530       | 446063           | 192.8            | 660       | 232931           | 0.0              | 790       | 12989            | 0.0              | 920       | 16238            | 0.0              |
| 405       | 9479             | 0.2              | 535       | 465110           | 167.4            | 665       | 204719           | 0.0              | 795       | 12106            | 0.0              | 925       | 14419            | 0.0              |
| 410       | 12414            | 0.5              | 540       | 479189           | 140.2            | 670       | 177096           | 0.0              | 800       | 12942            | 0.0              | 930       | 14788            | 0.0              |
| 415       | 21574            | 1.4              | 545       | 495864           | 115.2            | 675       | 153254           | 0.0              | 805       | 13253            | 0.0              | 935       | 18619            | 0.0              |
| 420       | 41448            | 4.7              | 550       | 516625           | 92.7             | 680       | 132874           | 0.0              | 810       | 12808            | 0.0              | 940       | 13995            | 0.0              |
| 425       | 79385            | 12.4             | 555       | 538555           | 72.6             | 685       | 115378           | 0.0              | 815       | 12903            | 0.0              | 945       | 18047            | 0.0              |
| 430       | 141845           | 30.0             | 560       | 562412           | 55.5             | 690       | 100157           | 0.0              | 820       | 12621            | 0.0              | 950       | 21418            | 0.0              |
| 435       | 231290           | 61.7             | 565       | 585835           | 41.1             | 695       | 85561            | 0.0              | 825       | 13903            | 0.0              | 955       | 23138            | 0.0              |
| 440       | 374482           | 125.1            | 570       | 608681           | 29.7             | 700       | 75396            | 0.0              | 830       | 11870            | 0.0              | 960       | 13665            | 0.0              |
| 445       | 596715           | 235.4            | 575       | 629563           | 21.0             | 705       | 65658            | 0.0              | 835       | 11069            | 0.0              | 965       | 14793            | 0.0              |
| 450       | 719656           | 331.6            | 580       | 646820           | 14.5             | 710       | 58172            | 0.0              | 840       | 15291            | 0.0              | 970       | 14396            | 0.0              |
| 455       | 530438           | 277.9            | 585       | 659231           | 9.8              | 715       | 52563            | 0.0              | 845       | 15125            | 0.0              | 975       | 11155            | 0.0              |
| 460       | 330446           | 194.7            | 590       | 665630           | 6.5              | 720       | 47085            | 0.0              | 850       | 15336            | 0.0              | 980       | 17987            | 0.0              |
| 465       | 241999           | 158.1            | 595       | 656228           | 4.2              | 725       | 41741            | 0.0              | 855       | 15791            | 0.0              | 985       | 16185            | 0.0              |
| 470       | 167096           | 119.6            | 600       | 646946           | 2.7              | 730       | 37415            | 0.0              | 860       | 14660            | 0.0              | 990       | 22120            | 0.0              |
| 475       | 113791           | 86.9             | 605       | 628643           | 1.7              | 735       | 32125            | 0.0              | 865       | 12528            | 0.0              | 995       | 11943            | 0.0              |
| 480       | 96126            | 77.2             | 610       | 599057           | 1.1              | 740       | 29322            | 0.0              | 870       | 14089            | 0.0              | 1000      | 16020            | 0.0              |
| 485       | 94467            | 77.9             | 615       | 565669           | 0.7              | 745       | 26862            | 0.0              | 875       | 11732            | 0.0              |           |                  |                  |

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TM-30-18

### Summary

$R_f = 76.5$   
 $R_g = 95.6$   
 CIE  $R_a = 75.1$   
 $R_g = -19.0$



### Color Vector Graphics



Individual Sample Fidelity Index ( $R_{f,i}$ )

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 66 | CES51 = 90 | CES76 = 56 |
| CES02 = 61 | CES27 = 89 | CES52 = 89 | CES77 = 73 |
| CES03 = 31 | CES28 = 83 | CES53 = 81 | CES78 = 58 |
| CES04 = 70 | CES29 = 69 | CES54 = 87 | CES79 = 84 |
| CES05 = 48 | CES30 = 84 | CES55 = 86 | CES80 = 81 |
| CES06 = 51 | CES31 = 72 | CES56 = 77 | CES81 = 79 |
| CES07 = 40 | CES32 = 64 | CES57 = 77 | CES82 = 92 |
| CES08 = 39 | CES33 = 79 | CES58 = 77 | CES83 = 90 |
| CES09 = 29 | CES34 = 73 | CES59 = 87 | CES84 = 87 |
| CES10 = 74 | CES35 = 85 | CES60 = 90 | CES85 = 78 |
| CES11 = 57 | CES36 = 91 | CES61 = 84 | CES86 = 73 |
| CES12 = 63 | CES37 = 81 | CES62 = 87 | CES87 = 79 |
| CES13 = 42 | CES38 = 94 | CES63 = 75 | CES88 = 83 |
| CES14 = 74 | CES39 = 96 | CES64 = 69 | CES89 = 73 |
| CES15 = 71 | CES40 = 91 | CES65 = 66 | CES90 = 83 |
| CES16 = 47 | CES41 = 94 | CES66 = 63 | CES91 = 76 |
| CES17 = 49 | CES42 = 82 | CES67 = 60 | CES92 = 62 |
| CES18 = 56 | CES43 = 78 | CES68 = 68 | CES93 = 77 |
| CES19 = 72 | CES44 = 99 | CES69 = 76 | CES94 = 57 |
| CES20 = 65 | CES45 = 86 | CES70 = 60 | CES95 = 69 |
| CES21 = 86 | CES46 = 84 | CES71 = 54 | CES96 = 79 |
| CES22 = 78 | CES47 = 87 | CES72 = 85 | CES97 = 86 |
| CES23 = 92 | CES48 = 80 | CES73 = 52 | CES98 = 79 |
| CES24 = 91 | CES49 = 82 | CES74 = 94 | CES99 = 69 |
| CES25 = 72 | CES50 = 90 | CES75 = 56 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)